

REMARKS

In response to an Office Action mailed on March 14, 2006, Applicant respectfully requests that the above-listed amendments be entered and the Application be reconsidered. With entry of the above-listed Amendments, claim 16 is amended. Seventeen claims are presented for examination. Of these, claims 1, 8 and 16 are independent, and the remaining claims are dependent.

The Examiner objected to Figs. 1 and 2, because these drawings include hand-written labels. Corrected drawing sheets are filed herewith.

The Examiner also objected to the drawings, because reference numeral "14" is mentioned in the specification, but this reference numeral is allegedly omitted from the drawings. The Applicant respectfully calls the Examiner's attention to the lightly-doped (or undoped) intrinsic region 24 shown in Figs. 1 and 2. The photodiode 14 is formed and shown in the intrinsic region 24 in Figs. 1 and 2. The intrinsic region 24 is shown as a dark area in the informal drawings (Figs. 1 and 2) that were filed with the Application. It is possible that the reference numeral (14) is not shown clearly within the dark area of the informal drawings; however, the reference numeral (14) is included in the dark area. The corrected drawings more clearly show the reference numeral.

The Examiner rejected claims 1, 8 and 16 under 35 U.S.C. 102(a) as being anticipated by US Pat. No. 6,580,109 to Danielle Thomas, *et al.* ("Thomas"). The Applicant respectfully traverses this rejection.

The Application discloses and claims a light conversion apparatus that includes a photodiode and a polysilicon-based receiving electrode coupled with the photodiode. For example, claim 1 recites, "a polysilicon-based receiving electrode ... coupled with the photodiode." (Emphasis added.) The receiving electrode permits received light to substantially pass through the receiving electrode to the photodiode, thereby increasing the amount of light that reaches the photodiode. In prior art photodiodes, opaque metal electrodes connected to the photodiode limit the amount of light that reaches the photodiode. The disclosed and claimed polysilicon-based receiving electrode enables more light to reach the photodiode than in prior-art photodiodes, because the light substantially passes through the electrode.

As noted in the Application, a germanium PIN photodiode includes two doped regions and an intrinsic (i.e., lightly doped or not doped) region between the doped regions. A potential difference is applied between the doped regions. If the intrinsic region is illuminated by light, a current flows through the photodiode. The strength of current is based at least in part on the amount of incoming light that is absorbed by the intrinsic region. Thus, it is important to maximize the amount of incoming light that reaches the intrinsic region. Prior-art photodiodes use metal electrodes, which block some of the incoming light and limit the amount of light that reaches the intrinsic region. The disclosed polysilicon-based receiving electrode permits the incoming light to substantially pass through the receiving electrode. Consequently, more incoming light reaches the intrinsic region.

Thomas discloses photodiodes fabricated using CMOS process technology. The Examiner asserted that Thomas discloses silicon-based films (76, 78) “as a polysilicon-based receiving electrode for receiving light to be converted by photodiodes (18, 20).” (Emphasis added.) Although light passes through the cited films (76, 78), these films are not electrodes, as recited in the claims. For example, claim 1 recites, “a polysilicon-based receiving electrode ... coupled with the photodiode.” (Emphasis added.)

The cited films (76, 78) are antireflective dielectric films formed above P-type regions 56 or 58 (Figs. 1B and 1C, respectively). (Thomas, col. 5, lines 15-23.) The cited films (76, 78) are not electrodes. Thomas’ electrodes (referred to as “contacts 74”) are coupled to the photodiode (18, 20) around the periphery of the photodiode. (Col. 6, lines 7-17.)

In fact, the cited films (76, 78) do not exist where the contacts 74 couple to the photodiode. The cited films (76, 78) are formed from a starting dielectric film that is formed over the entire device 10 and then removed in selected regions. (Col. 5, lines 23-27.) In particular, the starting dielectric film is removed where contact layers (70, 72, 74) are to be formed. (Col. 5, lines 27-36.) Thus, the cited films (76, 78) are not electrodes. Furthermore, Thomas’s contact 74 overlaps an annular portion of the photodiode, thereby shading that portion of the photodiode from incoming light. Thomas’ photodiode exhibits, therefore, the type of problem addressed by the present invention.

No art of record, either alone or in combination, discloses or suggests a light conversion apparatus that includes “a germanium-based photodiode and a polysilicon-based receiving

electrode ... coupled with the photodiode", as recited in claim 1. (Emphasis added.) For at least this reason, claim 1 is believed to be allowable.

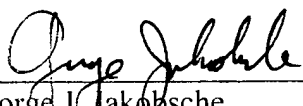
Claim 8 contains a similar recitation. Claim 8 is, therefore, believed to be allowable, for at least the reasons discussed above, with respect to claim 1.

Claim 16 has been amended to recite, "polysilicon-based means for receiving light to be converted by the photodiode and for transmitting electrical signals produced by the photodiode to another component ..." Amended claim 16 is believed to be allowable, for at least the reasons discussed above, with respect to claim 1.

The Examiner rejected claims 2, 3, 5-7, 9, 12-15, 17-19 and 21 under 35 U.S.C. 103(a) as being obvious over Thomas. Claims 2, 3, 5-7, 9, 12-15, 17-19 and 21 depend directly or indirectly from claim 1, 8 or 16. These dependent claims are, therefore, believed to be allowable, for at least the reasons discussed above, with respect to claim 1.

For all the foregoing reasons, it is respectfully submitted that the present Application is in a condition for allowance, and such action is earnestly solicited. Applicant hereby requests that any extension-of-time or other fee required for timely consideration of this application be charged to Deposit Account No. 19-4972. The Examiner is encouraged to telephone the undersigned attorney to discuss any matter that would expedite allowance of the present Application.

Respectfully submitted,


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